WHAT IS CLAIMED

1. An optical antenna for interfacing a light beam with an optical aperture comprising:

a light directing element having an optical axis fixedly mounted at a first location of said optical antenna, and being operative to focus said light beam incident thereon onto an optical relay element coupled with said optical aperture; and

an optical waveguide passing through a controllably orientable support structure that is mounted at a second location of said optical antenna, so that an end of said optical waveguide is coupled with said optical aperture, said controllably orientable support structure being anchored to a plurality of anchoring locations by respective actuator wires, through which currents are controllably supplied for adjusting lengths of said wires and thus the orientation of said controllably orientable structure relative to said optical axis of said light directing element, and thereby defining deflection of said optical waveguide relative to said optical axis of said light directing element.

2. The optical antenna according to claim 1, wherein first and second actuator wires attached at first and second anchoring locations on said controllably orientable structure, said first and second anchoring locations lying in a first plane through which said optical axis passes, and wherein a first line from

said first anchoring location to a point on said first plane through which said optical axis passes is orthogonal to a second line from said second anchoring location to said point on said first plane.

3. The optical antenna according to claim 2, wherein said first and second actuator wires are further attached at third and fourth anchoring locations spaced apart from said controllably orientable structure, said third and fourth anchoring locations lying in a second plane through which said optical axis passes, and wherein a third line from said third anchoring location to a point on said third plane through which said optical axis passes is orthogonal to a fourth line from said fourth anchoring location to said point on said second plane.

4. The optical antenna according to claim 3, further comprising a biasing element that imparts a biasing force against said controllably orientable support structure in a direction associated with deflection of said optical waveguide off the axis of said light directing element.

5. The optical antenna according to claim 3, further comprising a housing having a first portion at which said light directing element is fixedly mounted, and a second portion at which said controllably orientable support structure is mounted.

6. The optical antenna according to claim 5, wherein said controllably orientable support structure comprises a control arm having a first portion thereof supported at said second end of said housing by way of a flexure, and having second and third portions respectively containing said first and second anchoring locations.

7. The optical antenna according to claim 6, further comprising an optical waveguide retention element at said second end of said housing, and being translatable along said optical axis of said light directing element.

8. The optical antenna according to claim 1, wherein said optical waveguide comprises one of an optical fiber rod and an optical fiber installed in a syringe type needle tube.

9. The optical antenna according to claim 1, wherein control currents are applied to said actuator wires, so that the aiming position of said light relay element may be continuously adjusted, as necessary, to cause said optical antenna to effectively track a received light beam.

10. The optical antenna according to claim 5, wherein said controllably orientable support structure

comprises respective inner and outer ring members, said optical waveguide being bearing-mounted within said inner ring member, said inner ring member being bearing-mounted within said outer ring member, said outer ring member being fixed within said second portion of said housing.

11. The optical antenna according to claim 10, wherein said optical waveguide comprises a generally longitudinal tubular structure through which an optical fiber passes, and being integral with and extending from a generally disc-shaped member that is bearing-mounted within said inner ring member.

12. The optical antenna according to claim 11, wherein said generally longitudinal tubular structure is configured to support therein an inner tube, which retains said optical fiber and is axially translatable relative to said generally disc-shaped member.

13. The optical antenna according to claim 12, further comprising a biasing element that imparts a biasing force against said generally disc-shaped member in a direction associated with deflection of said generally longitudinal tubular structure off the axis of said light directing element.

14. The optical antenna according to claim 10, wherein said optical waveguide is mounted within said

inner ring member by means of C-flex type bearings, and said inner ring member is within said outer ring member by means of C-flex type bearings.

15. The optical antenna according to claim 10, wherein said housing is affixed to a pan and tilt mounting structure, that provides for adjustment of the aiming direction of said optical antenna in azimuth and elevation.

16. The optical antenna according to claim 15, wherein said pan and tilt mounting structure comprises:

a mounting plate upon which a toothed pan wheel is mounted for rotation about an azimuth axis that is normal to the surface of said mounting plate, and a pair of pan pivot pins supported at said surface of said mounting plate adjacent to the perimeter of said toothed pan wheel, and being sized and spaced to allow insertion of a tool blade therebetween to engage a tooth of said toothed pan wheel and impart incremental rotational translation of said toothed pan wheel about said azimuth axis; and

an elevation adjustment support frame, supported on said toothed pan wheel, and containing an elevation adjustment axle that is normal to said azimuth axis, a toothed tilt wheel mounted for rotation about the elevation axis of said elevation adjustment axle, and a housing support element upon which said housing is mounted, which engages said toothed tilt wheel, such

that rotation of said toothed tilt wheel about said elevation axis causes rotation of said housing support element and thereby said housing containing said lens and said optical waveguide about said elevation axis.

17. The optical antenna according to claim 16, wherein said elevation adjustment support frame contains a tilt pivot slot that provides access to said toothed tilt wheel, and is sized to allow insertion of a tool blade to engage a tooth of said toothed tilt wheel and impart incremental rotational translation of said toothed tilt wheel about said elevation axis.

18. The optical antenna according to claim 16, further including

an azimuth axis mounting bolt, that is coaxial with said azimuth axis and passes through apertures in each of said toothed pan wheel and said mounting plate and an associated tightening fitting which is adapted to tighten said toothed pan wheel against said mounting plate and thereby prevent rotation of said toothed pan wheel relative to said mounting plate; and

wherein said elevation adjustment axle comprises an elevation axle mounting bolt, that passes through apertures in said housing support element, toothed tilt wheel and said elevation adjustment support frame, and an associated tightening fitting which is adapted to tighten said toothed tilt wheel against said elevation adjustment support frame and said housing support

element, and thereby prevent rotation of said toothed tilt wheel and said housing support element relative to said elevation adjustment support frame.

19. An optical antenna for interfacing a light beam with an optical aperture comprising:

an optical cartridge having a forward end that captures a light directing element, said light directing element interfacing light between an end of a light relay element retained by a control arm in the interior of said cartridge and free space. cartridge;

a plurality of actuator wires having respective first wire terminations at said forward end of said optical cartridge, said first wire terminations being mutually rotationally displaced a rotational distance of 90° from one another in a plane normal to a boresight axis of the cartridge, said actuator wires having second wire terminations coupled to respective locations of said control arm and being mutually rotationally displaced a rotational distance of 90° from one another in a plane passing through said control arm and being normal to said boresight axis of the cartridge; and

a current supply device that supplies heating currents to said actuator wires, so as to change the lengths of said wires and thereby flexing said control arm and said light relay element about said boresight axis.

20. The optical antenna according to claim 19, wherein control currents are applied to said actuator wires, so that the aiming position of said light relay element may be continuously adjusted, as necessary, to cause said optical antenna to effectively track a received light beam.

21. The optical antenna according to claim 19, further comprising a pan/tilt mount, that is configured to rigidly attach the optical antenna to a supporting surface, while providing for incremental manual coarse adjustment of the pointing direction of the antenna for both azimuth and elevation.

22. The optical antenna according to claim 19, wherein said light relay element comprises a fiber rod, that is retained by a fiber rod connector, so as to project coaxially along said boresight axis in the interior of said cartridge, and being positionable to bring an end facet thereof coincident with the focal plane of said light directing element.

23. The optical antenna according to claim 19, wherein said fiber rod passes through a bore of said control arm, so that off-axis deflection of said control arm imparts a corresponding off-axis deflection of said fiber rod.

24. The optical antenna according to claim 19, wherein said light relay element comprises a section of multimode fiber fed through a section of syringe needle tubing which is retained in said cartridge by a connector therefor.

25. An optical antenna for interfacing a light beam with an optical aperture comprising:

an optical cartridge having a forward end that captures a light directing element, said light directing element interfacing light between an end of a light relay element retained by a support tube device therefor in the interior of said cartridge and free space.

a plurality of actuator wires having respective first wire terminations at said forward end of said optical cartridge, said first wire terminations being mutually rotationally displaced a rotational distance of 90° from one another in a plane normal to a boresight axis of the cartridge, said actuator wires having second wire terminations coupled to respective locations of said support tube device, and being mutually rotationally displaced a rotational distance of 90° from one another in a plane passing through said support tube device and being normal to said boresight axis of the cartridge; and

a current supply device that supplies heating currents to said actuator wires, so as to change the lengths of said wires and thereby flexing said support

tube device and said light relay element about said boresight axis.

26. The optical antenna according to claim 25, further comprising a pan/tilt mount, that is configured to rigidly attach the optical antenna to a supporting surface, while providing for incremental manual coarse adjustment of the pointing direction of the antenna for both azimuth and elevation.

27. The optical antenna according to claim 25, wherein said support tube device is support by a pair of inner and outer rings and an associated set of C-flex type bearing joints for mutually orthogonal rotation within a generally cylindrical back plate installed within said cartridge, said support tube device containing focus control screw tube and a fiber cable assembly, and wherein first ends of said actuator wires are connected to terminations around said light directing element, while other ends of said wire segments is secured to a respective location of a generally disc-shaped base from which a light pointer tube of said support tube device projects along said boresight axis.

28. The optical antenna according to claim 28, wherein control currents are applied to said actuator wires, so that the aiming position of said light relay element may be continuously adjusted, as necessary, to

cause said optical antenna to effectively track a received light beam.